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### User Notice

The manual is written for the current product. In case of modifications and software upgrades, the information contained in this document is subject to change without notice.

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**Note:** The user manual is applicable for two-channel IBP (IBP1 and IBP2) and four-channel IBP (IBP1, IBP2, IBP3 and IBP4). Please refer to relative contents according to your product.

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## Chapter 1 Introduction

The **Multiparameter Simulator** is a kind of small, lightweight portable device. It can accurately simulate the 12-lead ECG, respiration, temperature and IBP channels-1, 2, 3 and 4. ECG includes about 30 kinds of arrhythmia (including atrial arrhythmia, ventricular arrhythmia, conduction block, etc.), normal sinus rhythm (which can be adjusted for a wide range of heart rate and amplitude adjustments), performance testing wave (sine wave, triangle wave, square wave, etc.), pacemaker (asynchronous, noncapture, nonfunction, etc.), and ST segment. The **Multiparameter Simulator** generates a variety of respiratory rates, 4 kinds of impedance and apnea (OR/MIN) of 12, 22 and 32 seconds. The Multiparameter Simulator can simulate four kinds of temperature and four-channel IBP (static-pressure levels and dynamic IBP waveforms).

In addition to built-in functions, The **Multiparameter Simulator** can also use the external ECG data.

Slide the touch-screen to switch between ECG waveform and respiratory waveform. So you can observe and compare the waveforms conveniently.

The **Multiparameter Simulator** has the function list. So you do not need to remember the functions. And also you can select a function by double-clicking one item of the list.

In addition, when powering on the system, the **Multiparameter Simulator** will sound alarm. And also it can calibrate the screen.

The display can show in Chinese and English, so you can operate it conveniently.

## Chapter 2 Safety Considerations

- **Warning!** Please read the manual carefully before using the **Multiparameter Simulator**, and operate according to this manual strictly.
- As for abnormality, human injury and equipment damages caused by wrong operation, which violates the rules in manual, our company assumes no responsibility for this kind of danger and will not maintain free for this kind of malfunction.
- **Warning!** Internal Voltage. Always turn off the Multiparameter Simulator and unplug the adapter before replacing the batteries or cleaning the outer surface.
- Check the products. After power-on and connection, if the new Multiparameter Simulator has been damaged or the new Multiparameter Simulator system fails to start or to operate successfully, please contact us immediately.
- **Warning!** Liquids. Avoid spilling liquids on the instrument. Fluid seepage into internal components creates corrosion and a potential shock hazard. Do not

- operate the instrument if internal components are exposed to fluid.
- Do not open the Multiparameter Simulator, there are not any parts inside which you can replace by yourself.
- Do not operate it with the defibrillation instrument.
- The Multiparameter Simulator should be adjusted annually.
- Authorized service personnel should service the Multiparameter Simulator. Only qualified technical personnel should perform troubleshooting and service procedures.
- **Caution: Environmental Conditions.** Do not expose the instrument to temperature extremes. Ambient operating temperature should remain between 15°C and 35°C. Storage temperature should remain between 0°C and 50°C. System performance may be adversely affected if the temperature fluctuates above or below these ranges, or if ambient humidity exceeds the maximum of 80%.
- **Caution: Do NOT Immers**e. Clean only with a damp, lint-free cloth using a mild detergent and wipe down gently.
- Caution: Inspection. Before each use, inspect the lead ends for wear, cracks, or breaks.

## Chapter 3 Abbreviation and Symbols

Abbreviation and Symbols	Meaning
°C	Degree Celsius
°F	Fahrenheit
DC	Direct current
uV	Microvolt
mV	Millivolt
V	Volt
BPM	Beats per minute
ms	Millisecond
mmHg	Millimeter mercury
Ω	Ohm
R/MIN	Breaths per minute
Hz	Hertz
m	Milli-( $10^{-3}$ )
RL	Right leg (lead)
LL	Left leg (lead)
RA	Right arm (lead)
LA	Left arm (lead)
cm	Centimeter

## Chapter 4 Specifications

### 4.1 Conventional

Keyboard:	10 numeric keys and 7 function keys
Display:	3.5-inch color TFT touch-screen (73mm (L) X 55mm (W))
ECG output connector:	Output to 10 ECG Sockets, color-coded to AHA and IEC Standards
Power:	Built-in 3700mAh/3.7V rechargeable lithium-polymer battery
Power Adaptor:	Output : 9V/1000mA DC power supply in USA
Environment:	Indoor use
Operating temperature:	15 to 35°C
Storage temperature:	0 to 50°C
Maximum operation humidity:	1°C below 80%, and 40°C, the linear reduction to 50%
Maximum storage humidity:	95%
Altitude:	Maximum 2000 m
Volume	
Length:	189 mm
Width:	141 mm
Thickness :	45 mm

### 4.2 Accessories

Item	Quantity
Standard components:	
User Manual (print version)	1
15V adapter or 9V adapter ( USA Production)	1
Optional Accessories:	
Temperature Cable	1
IBP Cable	1
Case Conversion Software and Operating Introduction	1
For more information, please contact your local dealer.	

### 4.3 ECG

**12-lead ECG**, with 9 independent outputs referenced to right leg (RL).

The default ECG Rate:	80 BPM
ECG Rate:	15, 20, 25, 30, 40, 60, 80, 100, 120, 140, 160, 180, 200, 220, 240, 260, 280, 300, 320, 340 and 350 BPM
The accuracy of ECG Rate:	±1%
The default amplitude:	1 mV

Amplitude: 0.5, 1.0, 1.5 and 2.0 mV

The accuracy of Amplitude: ±2% (Lead II)

#### ECG artifacts

ECG artifacts: 50 and 60 Hz, Muscle, Baseline drift and Breathing

#### ST Segment

The elevation of the ST segment: -0.8 mV to +0.8 mV, the step is 0.1 mV.

#### Pacemaker

Asynchronous

Non Capture

Non Function

Demand Occ Sinus

Demand Freq Sinus

A/V Sequential

Pacemaker-spike Amplitude (2, 4, 6, 8 and 10 mV)

Pacemaker-spike Width (0.1, 0.5, 1.0, 1.5 and 2.0 ms)

### 4.4 Arrhythmia

ATRIAL FIB:COARSE	ATRIAL FIB:FINE
ATRIAL FLUTTER	SINUS ARRHYTHMIA
MISSED BEAT	atrial TACHYCARDIA
NODAL RHYTHM	SUPRAVENT TACHY
PVCs 6/MIN	ATRIAL PAC
PVCs 12/MIN	NODAL PNC
PVCs 24/MIN	PVC1 LV FOCUS
PAIRED PVCs	PVC1 E LV FOCUS
MULTIFOCAL PVC	R ON T LV FOCUS
FREQ MULTIFOCAL	PVC2 RV FOCUS
RUN 5 PVCs	PVC2 E RV FOCUS
RUN 11 PVCs	R ON T RV FOCUS
BIGEMINY	VENT FIB:COARSE
TRIGEMINY	VENT FIB:FINE
VENT TACHYCARDIA	ASYSTOLE
1ST DEGREE HEART BLOCK	R BNDL BRANCH BLOCK
2ND DEGREE HEART BLOCK	L BNDL BRANCH BLOCK
3RD DEGREE HEART BLOCK	

### 4.5 Performance Testing Wave

Square: 0.125 and 2.0 Hz

Pulse: 30 and 60 BPM, the width of pulse wave is

60ms

Sine:

0.5, 5, 10, 40, 50, 60 and 100 Hz

Triangle:

2.0 and 2.5 Hz

#### **4.6 ANSI/AAMI EC13:2002 (optional)**

ECG Rate:	15, 20, 25, 30, 40, 60, 80, 100, 120, 140, 160, 180, 200, 220, 240, 250, 260, 280, 300, 320, 340 and 350 BPM
QRS-Wave Height:	0.5, 1.0, 2.0, 3.0, 4.0 and 5.0 mV
QRS-Wave Width:	40, 50, 60, 70, 80, 90, 100, 110 and 120 ms
T-Wave Height:	0.4, 0.6, 0.8, 1.0, 1.2 mV
<b>Standard adult ECG</b>	
ECG RATE:	80 BPM
QRS-Wave Width:	100 ms
QRS-Wave Height:	1.0 mV
T-Wave Width:	180 ms
T-Wave Height:	0.4 mV
Q_T:	350 ms
<b>Standard pediatric ECG</b>	
ECG RATE:	100 BPM
QRS-Wave Width:	60 ms
QRS-Wave Height:	1.0 mV
T-Wave Width:	130 ms
T-Wave Height :	0.4 mV
Q_T:	260 ms

#### **4.7 External ECG Data (optional)**

If using an external ECG case, you need to use the software provided by our company to convert the external ECG case to the case which the Multiparameter Simulator can use.

**Note:** Before converting the data of the case, you need to know the storage format, sampling frequency, sampling precision, data type, baseline location, calibration and lead sign.

#### **4.8 IBP**

##### **IBP Zeroing**

IBP 1:	0 mmHg
IBP 2:	0 mmHg
IBP 3:	0 mmHg
IBP 4:	0 mmHg

##### **Static-Pressure Levels**

IBP 1:	0, 80, 160, 240, 320 and 400 mmHg
IBP 2:	0, 50, 100, 150, 200 and 250 mmHg
IBP 3:	0, 20, 40, 60, 80 and 100 mmHg
IBP 4:	P4 tracks the static pressure levels of
P3	

### **Dynamic IBP waveforms**

Artery 120/80:	Channel 1, 2 and 3
Arteria radialis 120/80:	Channel 1, 2 and 3
Left Ventricle 120/00:	Channel 1, 2 and 3
Right Ventricle 25/00:	Channel 1, 2 and 3
Pulmonary Artery 25/10:	Channel 2 and 3
Left Atrium 14/4:	Channel 2 and 3
CVP 15/10:	Channel 2 and 3
Pulmonary Wedge 10/2	Channel 2 and 3
Channel 4:	
Auto Swan-Ganz (every 15 seconds): Wedge)	RA(CVP), RV, PA, PAW (Pulmonary press ENTER key to change every time ±1 mmHg
Man Swan-Ganz:	
The Accuracy Of IBP:	

### **4.9 Respiration**

Impedance:	0.2, 0.5, 1.0 and 3.0 $\Omega$
The Accuracy of Impedance:	±5%
Baseline impedance:	500, 1000, 1500 and 2000 $\Omega$
Lead selection:	LL
Respiration Rate:	0 (Apnea), 15, 20, 30, 40, 60, 80, 100,
120 and 150 R/MIN	
The Accuracy of Respiration Rate:	±2%
Apnea:	12 s, 22 s, 32 s

### **4.10 Temperature**

0°C ( 32°F), 24 °C ( 75°F), 37°C(98.6°F), 40°C (104 °F)
Accuracy: ±0.1°C

## Chapter 5 Project Name Description

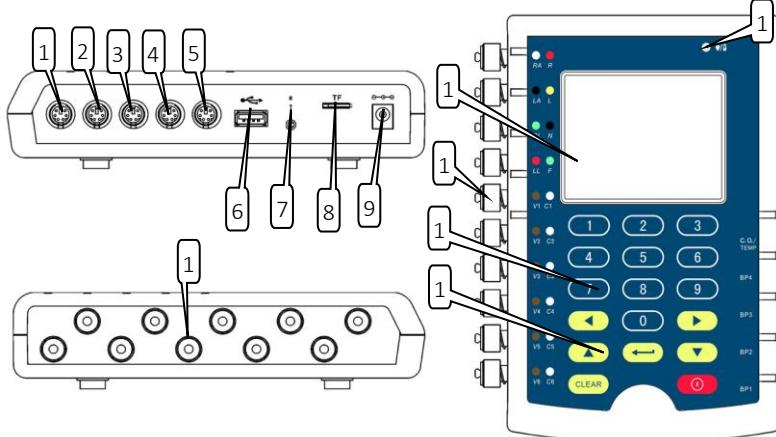


Fig.1 Appearance

Project	Name	Description												
1	IBP1 port	Used to connect IBP1 cable plug. (Refer to "IBP Line Orders")												
2	IBP2 port	Used to connect IBP2 cable plug. (Refer to "IBP Line Orders")												
3	IBP3 port	Used to connect IBP3 cable plug. (Refer to "IBP Line Orders")												
4	IBP4 port	Used to connect IBP4 cable plug. (Refer to "IBP Line Orders")												
5	C.O./TEMP port	The port is temperature port at present. <b>Note:</b> if you use this port, plugged the body temperature cables before turned on the Multiparameter Simulator.												
6	USB port	Reserved port												
7	Reset port	Switch the Multiparameter Simulator.												
8	TF port	Plug SD card. <b>Note:</b> If use the SD card, you need to put the SD card into the Multiparameter Simulator before turning it on.												
9	Equivalent power jack	According to the instructions of our company's power supply.												
10	10-lead jacks	Output to 10 Universal ECG Jacks, color-coded to AHA and IEC Standards. <table border="1"> <thead> <tr> <th>Label</th> <th>Meaning</th> </tr> </thead> <tbody> <tr> <td>RA or R</td> <td>Right arm</td> </tr> <tr> <td>LA or L</td> <td>Left arm</td> </tr> <tr> <td>RL or N</td> <td>Right leg(reference or grounded)</td> </tr> <tr> <td>LL or F</td> <td>Left leg</td> </tr> <tr> <td>V1, V2, V3, V4, V5 and V6</td> <td>V Leads (U.S. and Canada), also referred to as pericardial, precordial or</td> </tr> </tbody> </table>	Label	Meaning	RA or R	Right arm	LA or L	Left arm	RL or N	Right leg(reference or grounded)	LL or F	Left leg	V1, V2, V3, V4, V5 and V6	V Leads (U.S. and Canada), also referred to as pericardial, precordial or
Label	Meaning													
RA or R	Right arm													
LA or L	Left arm													
RL or N	Right leg(reference or grounded)													
LL or F	Left leg													
V1, V2, V3, V4, V5 and V6	V Leads (U.S. and Canada), also referred to as pericardial, precordial or													

		unipolar chest leads.
		C1, C2, C3, C4, C5 and C6
11	The indicator light of charging	Charge indicator light is red : AC power supply / charging. Green : full electricity. Red and flashing: battery low.
12	Display	The display shows the selected code, the meanings of the code, the waveforms, the list of the functions, System Setting and so on.
13	Keys	There are two kinds of keys: the numeric keys and function keys.
	0	View the current settings.
	1	Normal sinus rhythm, 80BPM, 1mV.
	2	Set the ECG Rate: 15, 20, 25, 30, 40, 60, 80, 100, 120, 140, 160, 180, 200, 220, 240, 260, 280, 300, 320, 340 and 350 BPM.
	3	Set amplitude: 0.5, 1.0, 1.5 and 2.0 mV.
	4	Set the respiratory Rate: 0 (Apnea), 15, 20, 30, 40, 60, 80, 100, 120 and 150 R/MIN.
	5	Set the baseline impedance: 500, 1000, 1500 and 2000Ω.
	6	Set the respiratory impedance : 0.2, 0.5, 1.0 and 3.0 Ω.
	7	Channel 1, 2, 3 and 4 will be reset to 0.
	8	Set all the channels as IBP waveform.
	9	Set all the channels as static-pressure level.
14	Control keys	
	Up and down keys	When select a key which can adjust a setting, you can click the up and down keys to adjust it.
	Left and right keys	Switch the pages and browse the codes.
	Enter	Determine the choice.
	CLEAR	Cancel the current selection, select the code again.
	On/Off	Long press the key to turn on or turn off the Multiparameter Simulator.

## Chapter 6 IBP Line Orders

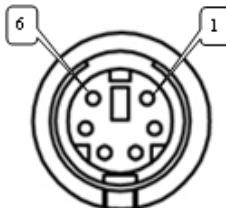


Fig.2 IBP line orders

Pin	Pin Meaning
2	IBP+
5	IBP-

## Chapter 7 Power to Multiparameter Simulator

The **Multiparameter Simulator** has a Built-in 3700mAh/3.7 V lithium battery. When the battery is too low, it will show a red indicator light on the top right and flash alarm. Then please use 9V DC adapter provided by our company to charge the **Multiparameter Simulator**. At the same time, the **Multiparameter Simulator** can be operated normally.

### Note:

- Do not replace the built-in battery by yourself.
- If you do not use the Multiparameter Simulator for a long time, please disconnect the equivalent power connection. And charge once every two months.

## Chapter 8 Page Introduction

### 1. Key

This page shows the detailed information of the current selected function, numeric keys, the left and right keys, the up and down keys, the clear key and enter key. You can enter the code to select the function. Shown in Fig.3:

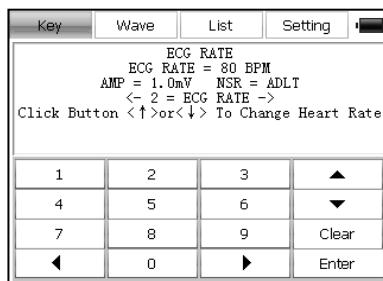


Fig.3

## 2. Wave

This page shows the current selected waveform which can display with the collection device synchronously, so you can compare with the sampling waveform conveniently. Shown in Fig.4:

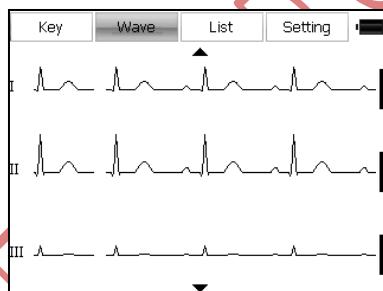


Fig.4

## 3. List

This page displays some information, including the codes and its meaning. Shown in Fig.5:

NO.	Type
0	VIEW SETTINGS
1	NORMAL SINUS RHYTHM
2	ECG RATE
3	ECG AMPLITUDE
4	RESPIRATION RATE
5	BASELINE IMPEDANCE
6	DELTA OHMS
7	BP ZERO
8	BP DYNAMIC
9	BP STATIC LEVELS
12	ATRIAL FIB:COARSE
13	ATRIAL FIB:FINE

Fig.5

#### 4. Setting

**Language:** Chinese and English.

**Data Source:** Built-in and SD Card.

**Display Timeout:** Off, 10 Sec, 30 Sec, 1 Min and 2 Min.

**The Others:** Lightness, Touch Calibrate, Version and Help. Shown in Fig.6:

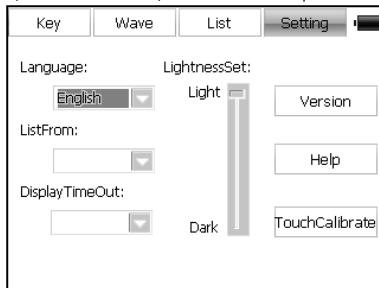


Fig.6

## Chapter 9 Operation

Please connect the **Multiparameter Simulator** to the tested device. There are some operation examples as follows:

### 1. Turn on the power, it will show the page as Fig.3.

When you right-click every time, the preset code increases 1. And when you left-click every time, the preset code decreases 1. For example: After right-clicking, the display will show the first preset code. When the preset code is selected, before pressing **ENTER**, you can click the left and right keys to browse the preset codes.

### 2. Keyed the code.

**Method 1:** For example, to simulate 0°C (32°F) (code 189), click the number keys **1 + 8 + 9**, then press **ENTER**. Before pressing **ENTER**, you can click the left and right keys to browse the preset codes. Press **CLEAR** (Clear), you can input the code again.

**Method 2:** For example, to simulate ATRIAL FIB: COARSE (code 12), in the "List" page, double-click the item (code 12), then the **Multiparameter Simulator** is simulating ATRIAL FIB:COARSE.

### 3. Click the up and down keys, you can adjust some settings.

For example, if you want to adjust heart rate, press **2**, then press **ENTER**, the display will show the current heart rate. Click the up key to increase heart rate, and click the down key to decrease heart rate.

#### 4. Switch the pages.

Click the touch-screen buttons, such as "Key", "Wave", "List" and "Setting", or click the left and right keys on the keyboard to switch the pages.

#### 5. View the waveform.

Select the "Wave" page. ECG is 12 leads, but the display of the **Multiparameter Simulator** only shows three leads waveforms. If you want to view the others, please click the up and down arrows on the touch-screen or slide the touch-screen up and down. Respiration waveform will display in the end of all ECG waveforms.

#### 6. Use external data.

For example: before booting, please place the SD card which has cases into the **Multiparameter Simulator**. After booting, select the "Setting" page, then select "SD Card" from "ListFrom". Select the "List" page, the list will show the information of the cases. And then you can double-click one item of the list to select a case.

**Note 1:** When you switch the pages by clicking the key on the keyboard, and if the current page is the "Wave", please select **CLEAR** firstly, and then you can click the left and right keys to switch the pages.

**Note 2:** In the "Setting" page, when you operate the Multiparameter Simulator by clicking the key on the keyboard, firstly click the up and down keys to switch the items. Secondly if you want to select an item, click **ENTER** on the item. Thirdly if you want to set the item, click the up and down keys. Finally click **ENTER** on the item to exit.

**Note 3:** At any time, press 0, and then click **ENTER** continuously, you can view the current settings of the parameters which include ECG, respiration, IBP and temperature. For example, select 0, the display shows "**O = VIEW SETTINGS**", then press **ENTER**, the setting of ECG is shown as "ECG Rate = --- BPM, AMP= --- mV, QRS wave = ---". Fig.7 shows the current setting of ECG.

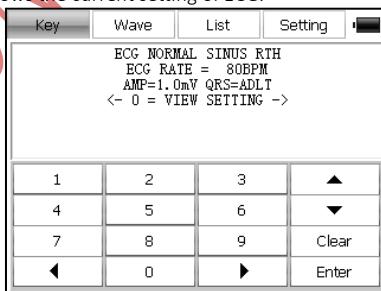


Fig.7

**Current settings:**

Display	Explanation
ECG	
AMP	ECG amplitude (unit: mV)
QRS	Adult
ECG RATE	Heart Rate (unit: BPM)
Respiratory	
RESP RATE	Respiratory Rate (unit: R/MIN)
RESP DELTA	Impedance Variables (unit: Ω)
BASELINE	Respiratory Baseline (unit: Ω)
IBP	
P1	IBP Channel 1 (unit: mmHg)
P2	IBP Channel 2 (unit: mmHg)
P3	IBP Channel 3 (unit: mmHg)
P4	IBP Channel 4 (unit: mmHg)
SENS	Sensor Sensitivity (unit: uV / V / mmHg)
Temperature	
TEMP	Temperature (unit: °C ('F))

## Chapter 10 Function

### 10.1 ECG / Arrhythmia

This section introduces simulation steps according to the functions. If you are not familiar with the basic operation of the **Multiparameter Simulator**, please read the "Operation" section. The **Multiparameter Simulator** can simulate many different types of arrhythmia, from nodal PNC to the asystole. In addition, it can also simulate a variety of performance testing waves, and be installed the 12-lead configuration, allowing each lead cable which refers to the right leg (RL) to output respectively.

#### 10.1.1 Normal Sinus Rhythm

Select "**1 = NORMAL SINUS RHYTHM**", the **Multiparameter Simulator** will simulate normal sinus rhythm. The heart rate is 80BPM and the amplitude is 1mV.

#### 10.1.2 ECG Rate

The **Multiparameter Simulator** can simulate 22 kinds of heart rate. First select "**2 = ECG RATE**", press **ENTER**, and then click the up and down keys to adjust the heart rate. It is adjustable to 15, 20, 25, 30, 40, 60, 80, 100, 120, 140, 160, 180, 200, 220, 240, 260, 280, 300, 320, 340 and 350 BPM.

**Note:** When you select "**1 = NORMAL SINUS RHYTHM**", the heart rate will become 80 BPM.

#### 10.1.3 Amplitude

The **Multiparameter Simulator** can simulate over a range of amplitudes (lead II). The accuracy is  $\pm 2\%$ . The amplitude setting applies to all the ECG waveforms except performance testing waves which have their own amplitude settings. You can select "**3 = ECG AMPLITUDE**", press **ENTER**, then use the up and down keys to adjust the amplitude. The amplitude is adjustable to 0.5, 1.0, 1.5 and 2.0 mV. The Setting is available before changing the amplitude or powering off the Multiparameter Simulator.

**Note:** When you select "**1 = NORMAL SINUS RHYTHM**", the amplitude will become 1mV.

#### 10.1.4 Arrhythmia: Artery

Code	Meaning
12	ATRIAL FIB:COARSE

13	ATRIAL FIB:FINE
14	ATRIAL FLUTTER
15	SINUS ARRHYTHMIA
16	MISSED BEAT
17	ATRIAL TACHYCARDIA
18	NODAL RHYTHM

#### 10.1.5 Arrhythmia: Atrial

Code	Meaning
21	PVCs 6/MIN
22	PVCs 12/MIN
23	PVCs 24/MIN
24	FREQ MULTIFOCAL
25	BIGEMINY
26	TRIGEMINY
27	PAIRED PVCs
28	RUN 5 PVCs
29	RUN 11 PVCs
30	VENT TACHYCARDIA
31	VENT FIB:COARSE
32	VENT FIB:FINE
33	ASYSTOLE

#### 10.1.6 Arrhythmia: Premature Beat

Code	Meaning
35	atrial PAC
36	NODAL PNC
37	PVC1 LV FOCUS
38	PVC1 E LV FOCUS
39	R ON T LV FOCUS
40	PVC2 RV FOCUS
41	PVC2 E RV FOCUS
42	R ON T RV FOCUS
43	MULTIFOCAL PVC

#### 10.1.7 Arrhythmia: Conduction Defects

Code	Meaning
46	1ST DEGREE HEART BLOCK
47	2ND DEGREE HEART BLOCK
48	3RD DEGREE HEART BLOCK
49	R BNDL BRANCH BLOCK
50	L BNDL BRANCH BLOCK

#### 10.1.8 ECG Artifact

The **Multiparameter Simulator** simulates a number of different ECG artifacts that can affect the accuracy of ECG. Select the following code to simulate ECG artifacts, which can be added to many ECG waves, including line-frequency artifacts of 60 Hz (U.S. lines) and 50 Hz (European lines), as well as artifacts for muscle, baseline, and respiration. When you select another ECG or arrhythmia, the ECG-artifacts are eliminated.

Code	Meaning
105	50HZ ARTIFACT
106	60HZ ARTIFACT
107	MUSCLE ARTIFACT
108	BASELINE ARTIFACT
109	RESPIRATION ARTIFACT

#### 10.1.9 Pacemaker

The **Multiparameter Simulator** can simulate six pacing signals. You can select the following code, press **ENTER**, and then these pacing signals are generated.

Code	Meaning
110	ASYNCHRONOUS
111	DEMAND FREQ SINUS
112	DEMAND OCC SINUS
113	A/V SEQUENTIAL
114	NON CAPTURE
115	NON FUNCTION

#### 10.1.10 Pacemaker-Spike Amplitude, Lead II

After selecting any pacing signals, you can adjust the pacemaker-spike amplitude of the lead II. It is adjustable to 2, 4, 6, 8 and 10 mV. Select "**116 = PACE AMP LEAD II (Lead II)**", press **ENTER**, and then click the up and down keys to adjust it.

#### 10.1.11 Pacemaker-Spike Width

After selecting any pacing signals, you can adjust the pacemaker-spike width. It is adjustable to 0.1, 0.5, 1.0, 1.5 and 2ms. Select "**117 = PACE AMP WIDTH**", press **ENTER**, and then click the up and down keys to adjust it.

### **10.1.12 ECG Performance Testing**

**Square:**

Code	Meaning
120	2HZ SQUARE WAVE
121	0.125HZ SQUARE WAVE

**Triangle Wave:**

Code	Meaning
122	2HZ TRIANGLE WAVE
123	2.5HZ TRIANGLE WAVE

**Pulse:**

Code	Meaning
124	PULSE = 30 BPM
125	PULSE = 60 BPM

**Sine Wave:**

The frequency of sine wave is adjustable to 0.5, 5, 10, 40, 50, 60 and 100 Hz. Select "126 = SINE WAVE", press **ENTER**, and then click the up and down keys to adjust it.

### **10.1.13 ST SEGMENT**

The elevation of the ST segment is adjustable to -0.8 to +0.8 mV. The step is 0.1 mV. Select "145 = ST segment", press **ENTER**, and then click the up and down keys to adjust it.

### **10.1.14 External ECG Data (optional)**

The **Multiparameter Simulator** has a variety of built-in functions. In addition, you can use an external ECG case. Before using the case, there is some work to be done as follows:

First, you need to fill some parameters of the case in the software provided by our company, including sampling frequency, data precision, storage format, baseline location and some other information. Then the case is converted into the type which the Multiparameter Simulator can use.

After converting a case, you can store it to a SD card .Then put the SD card into the Multiparameter Simulator. In the "Setting" page, select "SD Card" and then switch to the "List" page, the page will display the number and name of the case.

Then, double-click the number or name of the case, you will see the display start drawing waveforms, it completed to select a case successfully. The list is shown in Fig.8:

Key	Wave	List	Setting	
CaseID CaseName				
ECG0001	aami3a.dat			
ECG0002	aami3b.dat			
ECG0003	aami3c.dat			
ECG0004	aami3d.dat			
ECG0005	aami4a.dat			
ECG0006	aami4a_d.dat			
ECG0007	aami4a_h.dat			
ECG0008	aami4b.dat			
ECG0009	aami4b_d.dat			
ECG0010	aami4b_h.dat			

Fig.8

#### 10.1.15 ANSI/AAMI EC13:2002 (optional)

##### Standard Adult ECG

Select "51 = Adult ECG", press **ENTER**, and then the **Multiparameter Simulator** will generate standard adult ECG.

##### Standard Pediatric ECG

Select "59 = Pediatric ECG", press **ENTER**, and then the **Multiparameter Simulator** will generate standard pediatric ECG.

##### YY ECG Rate

ECG Rate is adjustable to 15, 20, 25, 30, 40, 60, 80, 100, 120, 140, 160, 180, 200, 220, 240, 250, 260, 280, 300, 320, 340 and 350 BPM. Select "52 = YY ECG Rate", press **ENTER**, and then you can click the up and down keys to adjust it.

##### QRS-wave Width

QRS-wave Width is adjustable to 40, 50, 60, 70, 80, 90, 100, 110 and 120ms. Select "53 = QRS-wave Width", press **ENTER**, and then you can click the up and down keys to adjust it.

##### QRS-wave Height

QRS-wave Height is adjustable to 0.5, 1.0, 2.0, 3.0, 4.0, 5.0 mV. Select "54 = QRS-wave Height", press **ENTER**, then you can click the up and down keys to adjust it.

##### T-wave Height

T-wave Height is adjustable to 0.4, 0.6, 0.8, 1.0, 1.2 mV. Select "55 = T-wave Height", press **ENTER**, then you can click the up and down keys to adjust it.

## 10.2 Respiratory

### 10.2.1 Respiration Rate

Respiration rate is generated from 0 to 150 R/MIN. Select "**4 = RESPIRATION RATE**", press **ENTER**, and then click the up and down keys to adjust it. The respiratory waveform is shown in Fig.9:

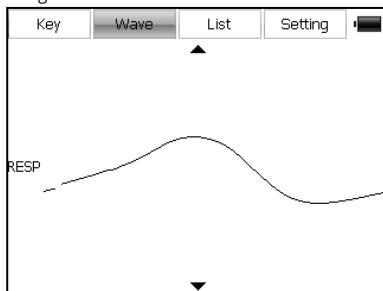


Fig.9

### 10.2.2 Respiration Impedance

Respiration impedance is adjustable to 0.2, 0.5, 1.0 and 3.0  $\Omega$ . Select "**6 = DELTA OHMS**", press **ENTER**, and then you can click the up and down keys to adjust it.

### 10.2.3 Baseline Impedance

Baseline impedance is adjustable to 500, 1000, 1500 and 2000  $\Omega$ . Select "**5 = BASELINE IMPEDANCE**", press **ENTER**, and then you can click the up and down keys to adjust it.

### 10.2.4 Apnea

The **Multiparameter Simulator** generates apnea (0 R/MIN) of 12, 22, and 32 seconds. You can enter the following code to set the type of apnea directly, and then press **ENTER**.

Code	Meaning
152	12 SEC APNEA
153	22 SEC APNEA
154	32 SEC APNEA

### 10.3 IBP

The **Multiparameter Simulator** simulates static-pressure levels and dynamic IBP waveforms. It provides calibrated static pressures and dynamic IBP waveforms to simulate signals such as artery, left- and right-ventricle and pulmonary-artery pressures. At the same time, it controls the channel 1, 2, 3 and 4. Dynamic IBP waveforms are synchronous with the heart rates of all the normal sinus rhythm.

**Note:** When you select "33 = ASYSTOLE", all the channels are reset to 0.

#### 10.3.1 IBP Zero

Select "7 = IBP ZERO", each channel will be reset to 0.

#### 10.3.2 Static-Pressure Levels

If you want to adjust the static-pressure level, select "9 = IBP STATIC LEVELS" directly, press **ENTER**, and then click the up and down keys to adjust it. The static-pressure level is shown in Fig.10 and Fig.11:

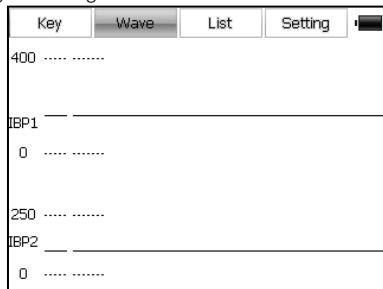


Fig.10

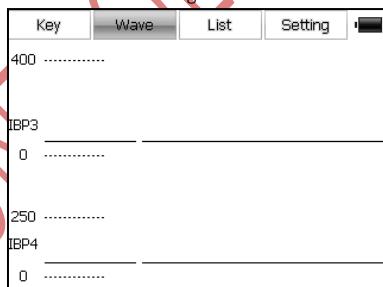


Fig.11

IBP1	IBP2	IBP3	IBP4
P1 = 0/mmHg	P2 = 0/mmHg	P3 = 0/mmHg	P4 = 0/mmHg
P1 = 80/mmHg	P2 = 50/mmHg	P3 = 20/mmHg	P4 = 20/mmHg
P1 = 160/mmHg	P2 = 100/mmHg	P3 = 40/mmHg	P4 = 40/mmHg
P1 = 240/mmHg	P2 = 150/mmHg	P3 = 60/mmHg	P4 = 60/mmHg
P1 = 320/mmHg	P2 = 200/mmHg	P3 = 80/mmHg	P4 = 80/mmHg
P1 = 400/mmHg	P2 = 250/mmHg	P3 = 100/mmHg	P4 = 100/mmHg

### 10.3.3 Dynamic IBP Waveforms

Select "8 = IBP DYNAMIC WAVEFORMS", then the channel 1 generates arterial 120/80mmHg (the highest pressure is 120mmHg, and the lowest pressure is 80mmHg), the channel 2 generates pulmonary arterial 25/10mmHg, the channel 3 generates pulmonary artery 25/00mmHg, and the channel 4 generates RA(CVP). You can enter 60-63 to change channel 1, enter 70-77 to change channel 2, enter 80-87 to change channel 3, and enter 88-89 to change channel 4. For example, select "60 = P1 ART 120/80", press **ENTER**, the channel 1 generates arterial 120/80mmHg, and then select "71 = P2 RAD 120/80", the channel 2 generates radial artery 120/80 mmHg. The waveforms of channel 1, 2, 3 and 4 shown in Fig.12 and Fig.13:

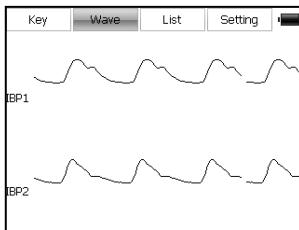


Fig.12

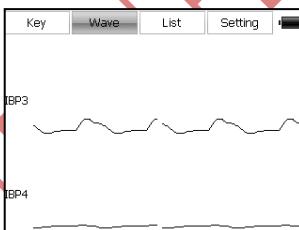


Fig.13

Channel P1

Code	Meaning
60	P1 ARTERIAL 120/80 mmHg
61	P1 RADIAL ARTERY 120/80 mmHg
62	P1 LEFT VENTRICLE 120/00 mmHg
63	P1 RIGHT VENTRICLE 25/00 mmHg

Channel P2

Code	Meaning
70	P2 ARTERIAL 120/80 mmHg

71	P2 RADIAL ARTERY 120/80 mmHg
72	P2 LEFT VENTRICLE 120/00 mmHg
73	P2 RIGHT VENTRICLE 25/00 mmHg
74	P2 PULMONARY ARTERY 25/10 mmHg
75	P2 PULMONARY WEDGE 10/2 mmHg
76	P2 LEFT ATRIUM 14/4 mmHg
77	P2 RIGHT ATRIUM CVP 15/10 mmHg

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### Channel P3

Code	Meaning
80	P3 ARTERIAL 120/80 mmHg
81	P3 RADIAL ARTERY 120/80 mmHg
82	P3 LEFT VENTRICLE 120/00 mmHg
83	P3RIGHT ATRIUM CVP 15/10 mmHg
84	P3 PULMONARY ARTERY 25/10 mmHg
85	P3 PULMONARY WEDGE 10/2 mmHg
86	P3 LEFT ATRIUM 14/4 mmHg
87	P3 RIGHT VENTRICLE 25/00 mmHg

### Channel P4

Code	Meaning
88	P4 SWAN-GANZ AUTO
89	P4 SWAN-GANZ MAN

### 10.4 Temperature

The **Multiparameter Simulator** provides four kinds of temperature simulations: 0°C, 24°C, 37°C and 40°C. You can enter the following code to set the temperature directly. Also you can select "193 = TEMP SELECT", press **ENTER**, and then click the up and down keys to adjust it. Before operating it, you need to use the temperature cable provided by our company.

Code	Meaning
189	0°C(32°F)
190	24°C(75°F)
191	37°C(98.6°F)
192	40°C(104°F)
193	Temperature selection

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